

Addendum to:

Hacienda Azucarera La Esperanza

(Sugar Plantation and Mill)

35 miles west of San Juan Baustusta

Manita Manati

Municipality of Manati

Puerto Rico

HAER No. PR-1

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WRITTEN AND DESCRIPTIVE HISTORICAL DATA

REDUCED COPIES OF MEASURED DRAWINGS

HISTORIC AMERICAN ENGINEERING RECORD

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PR,
55-MANA,
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Addendum to:

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PR-1

Location: In the Rio Grande de Manati valley, about 35 miles west of San Juan Baustista, in Manati, Municipality of Manati. Bounded on the north by the Atlantic Ocean, on the west by the Rio Grande de Manati, and to the east and south by haystack hills that are a part of the Karst Region of Puerto Rico.

Date of Construction: Plantation formed through a land aggregation process which had begun in the 1830s and continued into the 1870s.

Owner: Conservation Trust of Puerto Rico.

Significance: La Esperanza was established in the 1830s and by the 1860s was considered one of the largest land holdings on the North Coast of Puerto Rico. With the purchase of a steam engine in 1841, and another in the 1860s, the hacienda became one of the earliest mechanized sugar mills in Puerto Rico.

Prepared by: This historical report is based on the text of the brochure prepared for the dedication ceremony of the hacienda's West Point foundry steam engine as an American Society of Mechanical Engineers National Historic Landmark. The brochure was prepared in 1979 by Ms. Luz M. Graziani, of the Conservation Trust of Puerto Rico.

Hacienda La Esperanza is a 2,265-acre estate located in the fertile valley of the Rio Grande de Manati, about 35 miles west of San Juan Baustista, Puerto Rico's capital city. It is bounded to the north by the Atlantic Ocean; to the west by the Rio Grande de Manati; and to the east and south by haystack hills that are a part of the Karst Region of Puerto Rico, running eastward from Carolina to Aquadilla on the northwestern most tip of the island.

Hacienda La Esperanza was started by Fernando Fernandez, a career military man possibly from Castille, who arrived in Puerto Rico during the late 18th century. The hacienda was formed through a land aggregation process which began in the 1830s. By the 1850s, Jose Ramon Fernandez y Martinez, eldest son of Fernando, had inherited the land, and by the early 1870s he owned more than 2,000 acres. Ten years later, Hacienda La Esperanza comprised 85% of the low valley lands of the Rio Grande de Manati. By the 1860s, Fernandez was considered one of the wealthiest men of Puerto Rico, and he either bought or was granted the title of Marques de la Esperanza. By that time, he was also considered one of the most powerful men of the entire Spanish Caribbean.

The soils of Hacienda La Esperanza, rich in alluvial deposits and possibly the best on the north coast for agricultural production, allowed the Marques to flourish and to participate in the boom period of 1860-1880, providing economic, political, social, and cultural cohesion to the Spanish colony of Puerto Rico. By 1862, Hacienda La Esperanza's sugar mill was annually producing 135,000 pounds of "moscabado" (dark sugar) and 500 hogshead of molasses. The hacienda was assessed at 300,000 Spanish pesos, or roughly 300,000 U.S. gold dollars by mid-19th century rate of exchange. This assessment included cultivated and idle lands, tools, cattle, fuel, the sugar factory building and slave quarters. It did not include machinery or slaves.

Both slavery and steam technology played a major role in the Hacienda's sugar production. By the time of the Emancipation in 1873, 175 male and female slaves were working on the various phases of sugar cultivation and production. Most of them served as field workers, while others were skilled workers, such as masons, carpenters, blacksmiths, coopers, sailors, sugar makers, stokers, and mechanics. Steam technology reached the Hacienda around 1841 with the introduction of a steam engine. The only property identified in official records of 1847 as a hacienda proper was that of Jose Ramon Fernandez y Martinez' father, since only mechanized or partly mechanized productive units were so denominated. This leads one to conclude that La Esperanza could have been the first hacienda in the area to be partially mechanized. Industrial archeological investigations on the site strongly suggest that the Marques made extensive alterations to the old factory, apparently to accommodate a new 1861 West Point Foundry engine and mill, possibly a new boiler, and a second "Jamaican train."

There is little documentation with respect to the machinery and the factory layout. The scant evidence available--a judicial record of 1886--indicates that "the factory has a steam engine with its two-flue boiler, elaboration

(Jamaican) train, a conveyor belt, four evaporators and other tools." There is doubt as to what the term "evaporator" means in the context of this document, but if it refers to vacuum pans, then there can be no doubt that La Esperanza was possibly the most advanced sugar factory in Puerto Rico in the 1870s.

The Marques de La Esperanza

Jose Ramon Fernandez y Martinez, Marques de La Esperanza, was born in San Juan, possibly in 1808. In his early twenties, he was sent to study in England and later to the United States. No doubt during those years he came to know some of the people who later would help him. Some of those people supplied him with the capital needed to establish and expand his enterprises in Puerto Rico. For example, he was to associate himself with Philadelphian George C. Lattimer, U.S. Consul in San Juan and a sugar broker. Together, they formed the Lattimer & Fernandez Co., one of the most powerful companies on the island, dealing not only in sugar, molasses and rum, but in food, textiles, and other commodities, with the center of operations in San Juan.

The Marques was a powerful political figure. He wielded so much power that he was able to divide the territory comprising the municipality of Manati in two, making Barceloneta, a nearby small settlement, a separate town. His motives were obviously economic; if he were to use the port facilities at Manati with a customs house, he would have to declare all movement of goods and slaves with the resulting payment of taxes. He cleverly set up his own port facilities at Palmas Altas, at the mouth of Manati River, thus obtaining free movement for his merchandise. This may be the reason why researchers have not been able to locate any evidence on the introduction of the West Point Foundry steam engine and mill in Puerto Rico. There are no documents because the Marques did not have to declare to customs in his own port.

Politically, he was clearly identified with the conservative forces that tried forcefully to prevent any changes in the relationship of Puerto Rico with the metropolitan government of Spain.

In 1850, the Marques, along with Augusto de Cottes and Cornelio Kortwright, also very wealthy men, made a proposal to the government to build a railroad from San Juan to Arecibo. The proposal coincided with the spectacular development of railroads both in Europe and the United States. But it was not until the 1890s, after the Marques' death in 1883, that this project materialized.

There are documents which indicate that in 1879 the Marques consolidated two considerable debts totalling 200,000 pesos or 45,000 pounds. These may have been incurred during the late 1860s or early 1870s to mechanize Hacienda La Esperanza, and representing money borrowed from the Colonial Company, Ltd. of London, a major sugar financing source in the Caribbean. He was unable to pay his debts, and at the time of his death his estate was badly indebted. In

1885, Hacienda La Esperanza changed hands, having been bought in a very unclear transaction in London by Wenceslao Borda--a Colonial Company agent in Puerto Rico--for the amazing sum of 40,000 pesos (equivalent to 8,000 pounds); the same hacienda that had been assessed at 300,000 pesos.

After 1891, Borda continued the sugar planting operation, but apparently the West Point Foundry engine and sugar mill were never used again. The cane harvested there was sent to the nearby Central Monserrate for processing. Wenceslao Borda and his family were absentee owners who leased the land to various persons. Among those who cultivated the land during the first half of the 20th century were the Calaf family and Don Juan Davila Diaz, sugar producer and legislator. In 1975, the totality of Hacienda La Esperanza, 2,265 acres of land, according to a survey made for the Marques de La Esperanza in 1872, was acquired by the Conservation Trust of Puerto Rico.

The author wishes to acknowledge that this portion of the report is based on historical research carried out by Dr. Benjamin Nistal Moret, Assistant Professor, Department of Puerto Rican Studies, School of Social Sciences, Brooklyn College of the City University of New York, and Consultant to the Conservation Trust of Puerto Rico.

SUGAR MAKING AT HACIENDA LA ESPERANZA

Hacienda La Esperanza was a slave-operated sugar plantation which can be technologically characterized as semi-mechanized; that is, it had a crushing mill powered by a steam engine, but the processes of evaporation, purging, and packing were conducted manually. This method of sugar manufacture was characterized by a profound imbalance between the mechanized element, located at the beginning of production, and the rest of the process which maintained the elements of 18th century technology. The large capacity of the mill required a great number of agricultural workers (cane cutters, lifters and drivers), and at the same time necessitated an expansion of the clarification and evaporation equipment (where technological change had not occurred), thereby increasing the number of trains and boilers, but reducing the quality of the final product.

From the 1840s to the 1860s, Antillean sugar plantations produced three types of sugar: clayed, raw and "centrifugal." The production of clayed sugar required the use of thousands of moulds made of clay or metal. It is very unlikely that it was produced at La Esperanza; not a single trace of these moulds has been found in the archeological excavation. Moreover, by 1840, this type of sugar no longer had a big market. The possibility of La Esperanza producing centrifugal sugar has been eliminated because no evidence has been found in historical documents and there are no traces of centrifugal installations at the site. Another reason is that centrifugal sugar was considered refined sugar and, therefore, subject to very stiff tariffs under the U.S. Sugar Act of 1861, geared to protect the sugar refining industry which was one of the strongest in the United States.

There is enough evidence to assume that there have been three successive mills at Hacienda La Esperanza: an animal-powered mill with horizontal rolls of iron that possibly worked until the late 1830s or early 1840s; a second mill with a small steam engine and a horizontal crusher which may have survived until the late 1850s or early 1860s; and the present mill, thoroughly documented by physical remains and records. Based on estimates of similar mills in the Antilles, the first mill at La Esperanza produced between 100 to 150 tons of raw sugar per harvest. The second mill, whose size can be estimated on the basis of the remains of the conveyor, averaged perhaps 200 tons per crop.

The third mill may have produced between 500 to 600 tons per harvest. This volume established Hacienda La Esperanza as the largest producer of its time in Puerto Rico, and among the largest semi-mechanized operations in the Antilles. The sugar-to-cane yield should not have exceeded 5% as a crop average, although it is well established that the yield curve shows lows at the start and finish of the harvest, and a peak at the state of maximum maturity of the cane.

Sugar cane was planted in rows from three to five feet apart. In planting, pieces of cane twelve to fifteen inches long were placed in furrows about one foot deep. The pieces were laid horizontally, each end joining the end of the next. In poor land, two pieces were put side by side. The plant was then covered with soil, and as the shoots sprang up, the ground was cleared of weeds by hoeing. Cane planted in good land usually was ready to harvest one year after planting.

When the cane was ripe and ready for crushing, it was cut down with machetes. The stalks were cut about one foot above the ground, leaving the roots to grow again for the next year. The leaves were taken off and the top part cut off about one foot from the end. These ends and the leaves were used as fodder for cattle. The canes were then cut in pieces of about four feet long and carted to the mill. The period of harvest--called "zafra"--usually begins in early January, lasting until late May.

The fields were divided into sections, called "tablones," and spaces were left, at convenient distances, for carts to get in to take the cane to the mill. In good land, the cane did not require replanting for four to five years. Good lands in Puerto Rico and Cuba would produce four hogsheads of sugar per acre, while poor lands would not produce more than one-and-a-half to three hogsheads. The hogshead contains 1,700 pounds on the average.

As the climate is very damp at La Esperanza, and the mill is near the coast, the resulting humidity and salt-water spray made it necessary during the dead season, from June to late November (the months when the cane was growing), to dismantle and thoroughly clean the engine, and to remove, clean and pack all the brightwork (brasses). The parts of the machinery that could not be taken down and packed were coated for protection. The timbers and brickwork of the foundations were inspected for any settling, in consequence of the heavy rains during the dead season and the movements of the machine. Valves cylinders, etc., were adjusted and oiled.

The steam boiler at La Esperanza was of the type then in common use for mills that made open-kettle sugar, and known as a "lancashire" boiler. It had two flues and was built into brickwork. The fire passed through the two flues, returning under the bottom of the boiler and then to the chimney. The furnaces of the steam boiler were fired with wood, bagasse and, if wood was scarce, coal.

The mill for crushing the cane to extract the juice was the element of the machinery subject to the greatest stress and thus the one most liable to break down, so that maintenance was imperative. The mill had three rollers, set in a strong frame of cast iron, resting upon large timbers set upon solid foundations.

The conductor or cane carrier was an arrangement to convey the cane from the yard up into the mill. It consisted of two endless chains at each side, and boards or slats fastened to the chains. These chains passed over and around a drum in the yard, and another at the mouth of the mill, where the cane fell in as the conductor revolved. There was another conductor at the other end of the mill that conveyed the bagasse up to a point high enough for a cart to get under and to receive it as it came out of the mill.

The mill's engineer, Pedro Defontain, of French origin, was in charge of keeping the engine running steadily, not too fast, not too slow; maintaining the steam nearly always at the same pressure; seeing to it that the cane was laid on the carrier regularly; watching over the rollers; and ensuring that the juices flowed steadily to the collection pans.

The various stages of manufacturing sugar out of the cane may be described as follows: 1) the extraction of the juice from the cane, 2) the separation from the juice of all matter except sugar and water (known as defecation and clarification), 3) the removal of the water from the sugar (known as reduction or granulation), and 4) the cleansing of the sugar crystals by washing or draining (known as purging or curing).

At La Esperanza, the sugar cane was crushed in a "trapiche," consisting of three cast-iron rollers placed horizontally in a cast-iron frame. (The middle roller is called the king roller; the others are called the side roller and the macasse roller.) The sugar cane was fed by means of a slate gutter to the rollers. The juice ran into a gutter under the rollers and from there drained into big square pans or collectors. These collectors were kept clean at all times to prevent the start of fermentation that would sour the juice.

After the juice had been extracted, it was necessary to remove everything that contaminated it. This was done by adding lime, a strong alkali, which when combined with the albumens in the juice, coagulated. The process took place while the juice was in the defecating pans--large kettles at the extreme end of the "Jamaican train" (the term used for the line-up of equipment used in the entire process). The juice was heated at this stage and, as the temperature rose, more lime added. A thick, greenish-yellow scum formed at the surface. Boiling was carefully avoided, since it would break up the floating scum and diffuse it throughout the juice. The juice was then allowed to settle until it formed three layers: at the top, the coagulated scum; at the bottom, particulate matter; and in between, a clear and transparent liquid. The scum was removed with perforated strainer-like ladles attached to long wooden handles. From there, the clear juice flowed to the clarifiers, a set of big cast-iron kettles generally known as "taches," arranged in a row. At La Esperanza, there was a double set in tandem.

Heat was applied at each end of the "train," with the largest kettle farthest from it. The largest kettle was called the "propre" and was able to hold all the juice produced at one crushing. From there, the juice, reduced in volume,

passed to the next kettle, smaller than the first, called "flame" or "flambeau," where the heat was installed. Straining the scum was still done at that stage. From there, the juice, further reduced, passed first to the kettle known as "syrup" or "sirop," and then to the smallest one called "taiche" or "batterie."

In this last kettle, the syrup was further reduced, almost to the granulating point, or sufficiently concentrated to separate into grains of sugar upon cooling. At that point, a test was done by touch. A dab of syrup was taken upon the thumb, bringing the forefinger in contact with it, and rolling both fingers to see the length to which a thread of syrup could be drawn before it broke. The person who performed this test was called the "puntista."

From the "tache" or "batterie," the crystallized sugar went to the coolers--shallow open vessels, each one capable of containing around one hogshead of sugar. They were made of wood, so that cooling would be gradual. In about twenty-four hours, the sugar grained, that is, it formed into a soft mass of crystals imbedded in "melasses."

From the coolers, the sugar was taken in small carts to the curing or purging house, where it was packed in potting-casks called "bocoyes." The "melasses," still attached to the crystals, was left to drain into a container or reservoir under the casks, leaving the crystals almost dry. Within two or three weeks, and sometimes longer, the sugar was fit for shipment. Sugar produced by this method is known as "raw sugar."

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